

Appl. No. 10/648,900  
Amendment dated March 18, 2004  
Reply to Office Action of March 4, 2004

**REMARKS/ARGUMENTS**

This Amendment is responsive to the Office Action mailed March 4, 2004.

First, with respect to the Examiner's rejection to the disclosure because of a typographical error appearing on page 1, the pertinent paragraph of the specification has been amended so as to correctly recite U.S. Pat. No. 4,850,458. A convenience copy of this patent is enclosed with this Amendment in compliance of applicant's duty of disclosure. Particular attention is directed to Fig. 5 of this reference, which shows a skewed rotary brake having a plurality of cylindrical rollers arranged within rectangular slots arranged in an intermediate plate. Hence, this reference is believed to be cumulative with respect to the disclosure of Morgan U.S. Pat. No. 6,109,415, cited in applicant's specification and cited by the Examiner. In any event, this action is believed to fully correct the Examiner's objection to the specification, as noted in paragraph 5 of the recent Office Action.

Another paragraph of the specification has been amended to correct a simple and obvious typographical error.

Moreover, Applicant proposes to amend Fig. 2 to change reference numeral "25" to -- 28 --, as shown in the insert. This merely makes the drawing consistent with the specification.

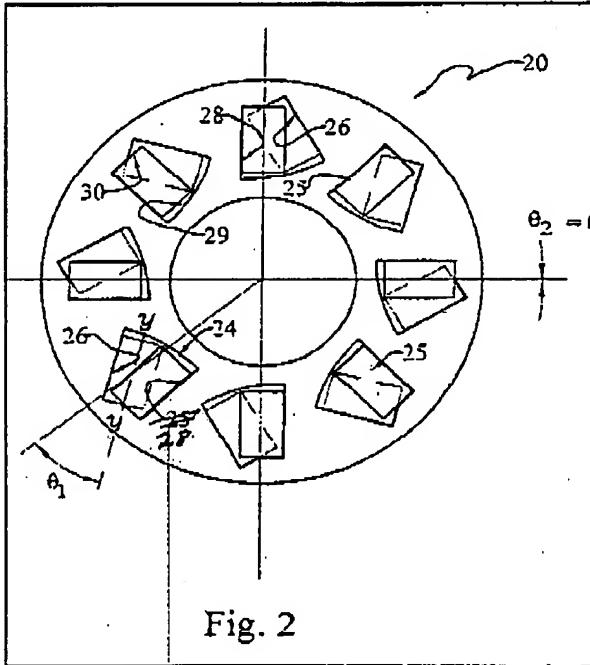


Fig. 2

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In paragraph 1 of the Office Action, the Examiner rejected claims 1-7 under 35 U.S.C. § 112, para. 2, as being allegedly "indefinite". Here, the Examiner said:

"Claim 1 is indefinite in that the recitation of 'resistance . . . may differ as a function'. This recitation is ambiguous and non-limiting. Does the resistance differ or not? Claims 2-7 are indefinite due to their dependency on claim 1."

In response to the foregoing, the "whereby" clause of claim 1 has been amended, as discussed *infra*. Incidental to that amendment, the "may differ as a function of" language has been deleted. Hence, this action is believed to address the alleged "indefiniteness" argument raised by the Examiner in paragraph 1.

In paragraphs 2 and 3, the Examiner rejected original application claims 1-7 under 35 U.S.C. § 102(b) as being allegedly "anticipated" by Morgan *et al.* (U.S. Pat. No. 6,109,415). Here, the Examiner was doubtless referring to the structure shown in Figs. 7 and 8 of Morgan. In his amplifying comments, the Examiner said:

"Morgan et al. show a skewed roller brake having first and second plates 36, 60 and an intermediate plate 61 [ sic; 51], which has a plurality of slots for holding rollers 74, see figure 7. Each slot has a first wall at a first angle and a second wall at a second angle. In this instance, the first and second angles are equal. The resistance 'may' differ to the broad degree claimed as a function of direction of rotation in that there are inherent mechanical imperfections that effect performance." (Emphasis added.)

Paragraph 3 continued with certain specific rejections of dependent claims 2-7.

Constrained skewed rollers as braking elements function by being effectively dragged axially at the same time that they roll as the brake is rotated about the brake axis. Thus the sliding friction of the roller is prevented from exhibiting typical initial high breakout force by the simultaneous

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rolling, which continually separates the roller and disk surfaces. The sliding friction force acts along the skewed contact line of the roller, which, because of the skewed angle, acts at a finite moment arm around the center of rotation of the brake and provides braking torque. Thus the torque of the brake, in addition to being a function of the axial loading force, is also a function of the roller skew angle.

In some applications of known skewed roller brakes, it is desirable to provide braking for only one direction of rotation. This has previously been done by coupling the brake reaction element to structure through an over-running (one way) clutch. The present invention achieves this same function without requiring the additional hardware of the clutch.

This is accomplished by recognizing that the skewed roller brake can be improved by opening the roller slots to allow the rollers to "flip" as the brake rotation is reversed so that the skew angle is changed. To achieve the effect of the over-running clutch, one of the opposed slot walls is made parallel to a radius from the brake center of rotation so that, when the roller is constrained by that wall, it is not dragged along its axis but only rolls, thus minimizing the brake torque is minimized.

As the Examiner is well aware, this application was filed with seven original claims. Of these, only claim 1 was presented in independent form. Claims 2-7 were severally dependent on independent claim 1, and are to be construed as incorporating by reference all of the limitations of that main claim. 35 U.S.C. § 112, para. 5.

In response to the Office Action, and to better define the invention and to clarify the point of patentable distinction over the prior art, claim 1 has been amended, as discussed below. Claims 2-3 and 5-6 have been amended. Claim 7 has been deleted inasmuch as its additive content has been incorporated into amended claim 1. In addition, this amendment presents new claims 8 and 9 for

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examination.

For the Examiner's convenience, amended claim 1 is reproduced herebelow, and is annotated with parenthetical reference to the corresponding parts, portions or surfaces of the disclosed embodiment, merely for purposes of illustration and not by way of limitation:

"1. (Currently Amended) In a skewed roller brake assembly (20) having a main axis of rotation (x-x), having a first plate (21) adapted to be rotated about said main axis, having a second plate (22) adapted to be rotated relative to said first plate about said main axis, and having an intermediate plate (23) adapted to be rotated about said main axis and positioned between said first and second plates, said first and second plates being adapted to be axially loaded (e.g., by force  $F-F$ ) with respect to one another, said intermediate plate having a slot bounded by a first wall (26) that is arranged at a first skew angle ( $\theta_1$ ) with respect to a radius from said main axis, and having a cylindrical roller (25) arranged in said slot for rolling engagement with said first and second plates about the axis of said roller (y-y) such that said roller axis will be urged toward a position parallel to said first wall when said first and second plates are rotated relative to one another in one angular direction, the improvement which comprises:

    said slot having a second wall (28) opposed but not parallel to said first wall and arranged at a second skew angle ( $\theta_2$ ) with respect to a radius from said main axis such that said roller axis will be urged toward a position parallel to said second wall when said first and second plates are rotated relative to one another in the opposite angular direction;

    whereby the frictional resistance to relative rotation between said first and second plates determined by the skew angle of said roller axis for the same value of axial loading will change between a first value and a second value as the direction of relative angular rotation between said first and second plates is reversed." (Parenthetical reference added.)

As will be seen from the above, claim 1 has been amended to specify that the intermediate plate is adapted to be rotated about the main axis. Moreover, the claim specifies that the slot has a first wall that is arranged at a first skew angle with respect to a radius from the main axis. The claim

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then continues to require that the slot have a second wall that is opposed, but not parallel to, the first wall and arranged at a second skew angle with respect to a radius from the main axis. Thus, the claim has been amended to specifically require that the first and second walls of the associated slot be non-parallel. This immediately distinguishes applicant's invention from the Morgan reference. In his amplifying comments, the Examiner specifically noted that skew angles of Morgan's slot are equal. Thus, applicant's claims immediately distinguish from Morgan by requiring that the first and second walls be opposed, but not parallel, to one another.

Moreover, the whereby clause specifically requires that "the frictional resistance to relative rotation between the first and second plates determined by the skew angle of the roller axis for the same value of axial loading will change between a first value and a second value as the direction of relative angular rotation between the first and second plates is reversed". This clarifies the nature of applicant's invention, and whether it distinguishes from the clear teaching of Morgan. In Morgan, each roller is held at a substantially constant skew axis regardless of the direction of relative rotation between the plates. In applicant's invention, on the other hand, the slot is specially configured with the first and second walls being opposed, but not parallel to one another. Hence, when the two plates are rotated in one angular direction, the roller axis may be generally parallel to one of the walls, but not the other. Conversely, when the direction of relative rotation is reversed, the roller will move to an alternative position at which the roller axis is parallel to the second slot wall, but not the first. Thus, unlike the Morgan reference, the skew angle varies between first and second values as the direction of relative angular rotation between the first and second plates is reversed. Hence, claim 1 is believed to clearly and unequivocally distinguish patentably from the prior art.

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Claims 2-3 and 4-5 have been amended so as to clarify details of the applicant's invention.

Inasmuch as these dependent claims continue to be dependent from independent claim 1, they are believed to patentably distinguish from the prior art in the same manner as claim 1.

New claims 8 and 9 bring out other aspects of applicant invention. However, they continue to distinguish patentably from the prior art in the same manner as claim 1. For the Examiner's convenience, claims 8 and 9 are reproduced herebelow with parenthetical reference to the corresponding parts, portions or surfaces of the disclosed embodiment for purposes of illustration.

"8. (New) A skewed roller brake assembly having a main axis of rotation (x-x), comprising:

a first plate (21) adapted to be rotated about said main axis;  
a second plate (22) adapted to be rotated relative to said first plate about said main axis, said first and second plates being adapted to be axially loaded with respect to one another (e.g., by force F-F);

an intermediate plate (23) positioned between said first and second plates and adapted to be rotated about said main axis, said intermediate plate having a slot bounded by a first wall (26) and an opposed but non-parallel second wall (28); and

a cylindrical roller (25) loosely contained in said slot for rolling engagement with said first and second plates about the axis of said roller (y-y), said roller being adapted to move to a position such that said roller axis will be substantially parallel to said slot first wall when said first and second plates are rotated in one relative angular direction and adapted to move to a position such that said roller axis will be substantially parallel to said slot second wall when said first and second plates are rotated in the opposite relative angular direction;

whereby the frictional resistance to relative rotation between said first and second plates determined by the skew angle ( $\theta$ ) of said roller axis with respect to a radius from said main axis for the same value of axial loading will change between a first value and a second value as the direction of relative angular rotation between said first and second plates is reversed." (Parenthetical reference added.)

"9. (New) A skewed roller brake assembly (20) having a main axis of rotation (x-x), comprising:

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a first plate (21) adapted to be rotated about said main axis;  
a second plate (22) adapted to be rotated relative to said first plate about said main axis, said first and second plates being adapted to be axially loaded with respect to one another (e.g., by force  $F-F'$ ); and

a cylindrical roller (25) positioned between said first and second plates for rolling engagement therewith about the axis of said roller ( $y-y$ ), said roller being constrained to move between a first position at which said roller axis will be at a first skew angle ( $\theta_1$ ) with respect to a radius from said main axis when said plates are relatively rotated in one angular direction and a second position at which said roller axis will be at a second skew angle ( $\theta_2$ ) with respect to said radius when said plates are relatively rotated in the opposite angular direction, said first and second skew angles being substantially different;

whereby the frictional resistance to relative rotation of said first and second plates determined by the skew angle of said roller axis for the same value of axial loading will change between a first value and a second value as the direction of relative angular rotation between said first and second plates is reversed." (Parenthetical reference added.)

Here again, claim 8 specifically requires that the intermediate plate have a slot that is "bounded by a first wall and an opposed but non-parallel second wall", and further recites that the cylindrical roller is "loosely contained" in the slot for rolling engagement with the first and second plates, and that the roller is adapted to move between two positions depending on the direction of relative rotation. Again, the whereby clause brings out the point of patentable distinction.

Claim 9 omits the requirement for the "intermediate plate". However, the claim again continues to define the feature of the invention that "said roller being constrained to move between a first position at which said roller access will be at a first skew angle with respect to a radius from said main access when the plates are relatively rotated in one angular direction and a second position at which said roller access will be at a second angle with respect to said radius when said plates are

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relatively rotated in the opposite angular direction". Here again, the claims specifically requires that the first and second skew angles be substantially different. The whereby clause again brings out the point of distinction. The form of claim 9 is believed to be entirely permissible under *Swinehart et al.*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971), wherein the court said:

"We take the characterization 'functional' as used by the Patent Office and argued by the parties, to indicate nothing more than the fact that an attempt is being made to define something (in this case a composition) by what it *does* rather than but what it *is* (as evidenced by specific structure or material, for example). In our view, there is nothing intrinsically wrong with the use of such a technique in drafting patent claims. Indeed[,] we have even recognized in the past the practical *necessity* for the use of functional language. See, for example, *In re Halleck*, 57 CCPA 954, 421 F.2d 911, 164 USPQ 647 (1970). We recognize that prior cases have hinted at a possible distinction in this area depending on the criticality of the particular point at which such language might appear. Our study of these cases have satisfied us, however, that any concern over the use of functional language at the so-called 'point of novelty' stems largely from the fear that applicant will attempt to distinguish over a reference disclosure by emphasizing a property or function which may not be mentioned by the reference and thereby assert that his claimed subject matter is novel. Such a concern is not only irrelevant, it is misplaced . . . .

We are convinced that there is no support, either in the actual holdings of prior cases or in the statute, for the proposition, put forward here that 'functional' language, in and of itself, renders a claim improper. We have also found no decision of this or any other court which may be said to hold that there is some other ground for objecting to a claim on the basis of *any* language, 'functional' or otherwise, beyond what is already sanctioned by the provisions of 35 U.S.C. 112." (439 F.2d at 212-13, 169 USPQ at 228-229 [Emphasis in original; footnotes omitted].)

Applicant's attorney has also reviewed the other prior art references cited by the Examiner.

However, these do not appear to be particularly relevant. Certainly, they do not add anything to the disclosure of Morgan.

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As mentioned above, Morgan discloses a device in which a cylindrical roller is restrained in a rectangular slot such that the roller remains at the same skew angle regardless of the direction of relative rotation between the plates engaging the roller. To the contrary, applicant's device has a roller that is loosely contained in a slot having non-parallel slot walls such that the roller may wobble between one position or another, thereby varying the skew angle, depending upon the direction of relative rotation. These features are clearly brought out in all of applicant's claims. Claims 1-6 and 8-9 are therefore believed to be in condition for allowance, and such action is courteously solicited.

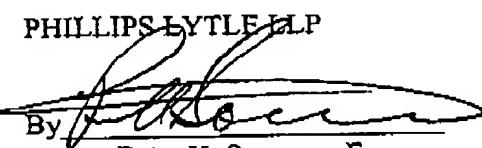
This Amendment is believed to be fully responsive to the Office Action of March 4, 2004; is believed to squarely address each and every ground for objection or rejection raised by the Examiner; and is further believed to materially advance the prosecution of this application toward immediate allowance.

Formal allowance of claims 1-6 and 8-9 is, therefore, courteously solicited.

Respectfully submitted,

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